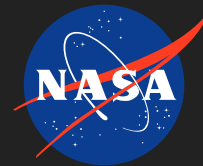


An Instrument to Measure Aircraft Sulfate Particle Emissions, Phase I

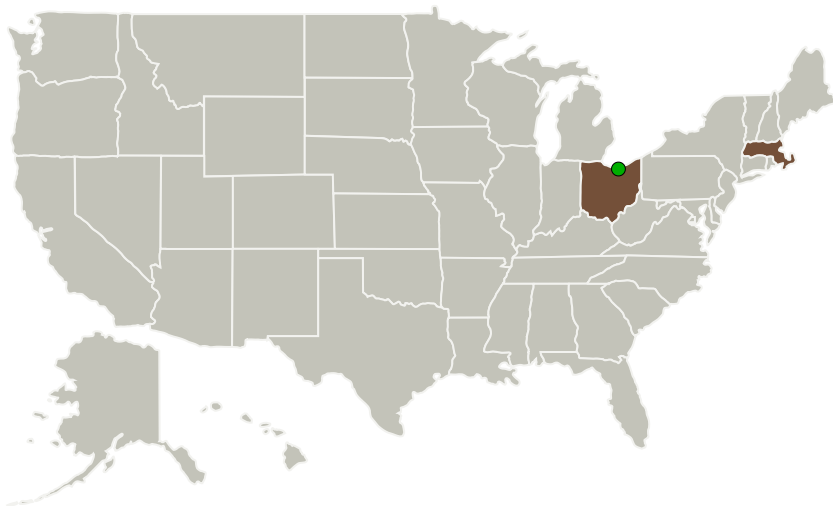


Completed Technology Project (2011 - 2011)

Project Introduction

Aircraft particle emissions contribute a modest, but growing, portion of the overall particle emissions budget. Characterizing aircraft particle emissions is required to improve aircraft combustor design and aircraft operating practices. Aircraft particle emissions are a complex mixture of soot and semi-volatile material, primarily inhabiting sizes smaller than 100 nm. New instruments are required to characterize aircraft particle emissions. We propose to build a new instrument for sensitive ($>200 \text{ ng m}^{-3}$ on a 1 Hz cycle) measurements of particle sulfate. The key instrument component will be a tunable infrared diode absorption spectrometer (TILDAS). Compared to existing sulfate measurement instruments, the TILDAS-sulfate instrument will be able to reject NO interferences, a key capability required for aircraft exhaust applications. Prior to reaching the TILDAS, gas phase SO₂ will be removed using an acid gas denuder and particle sulfate will be converted to SO₂ in a quartz oven. By running the TILDAS-sulfate in tandem with a commercial differential mobility analyzer, we anticipate obtaining size resolved sulfate mass loadings (10 size bins, from 10 nm to several hundred nm). Phase I tasks include evaluating acid gas denuder and SO₂-to-sulfate technologies, determining the instrument detection limits, demonstrating instrument discrimination against NO and other interferences, and demonstrating the use of the instrument to characterize simulated aircraft exhaust gas.

Primary U.S. Work Locations and Key Partners

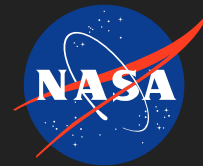


An Instrument to Measure
Aircraft Sulfate Particle
Emissions, Phase I

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An Instrument to Measure Aircraft Sulfate Particle Emissions, Phase I



Completed Technology Project (2011 - 2011)

Organizations Performing Work	Role	Type	Location
Aerodyne Research, Inc	Lead Organization	Industry	Billerica, Massachusetts
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140170>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Aerodyne Research, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

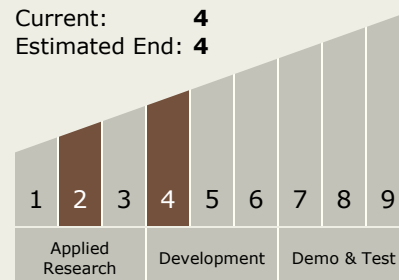
Carlos Torrez

Principal Investigator:

Michael T Timko

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



An Instrument to Measure Aircraft Sulfate Particle Emissions, Phase I

Completed Technology Project (2011 - 2011)



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.5 Modeling and Simulation for EDL

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System